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वस्त्र रंजक सामग्री — रंगाई परीक्षण द्वारा प्रत्यक्ष  
रंजकों की तीव्रता के निर्धारण की विधि  
( पहला पुनरीक्षण )

**Textile Dyestuffs — Method for  
Determination of Strength of  
Direct Dyestuffs by Dyeing Test**  
( *First Revision* )

ICS 59.040

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## FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Textile Speciality Chemicals and Dyestuffs Sectional Committee had been approved by the Textiles Division Council.

This standard was first published in 1967 and the present revision has been taken up to update in line with the developments in the dyeing industry. Direct dyes are marketed in large varieties, different strengths and also as mixtures. The method laid down in this standard for determining the strength of dyestuffs against a mutually accepted standard would be useful for assessing both the strength and the shade of the dyestuff.

The method prescribed in the standard is a general method and wherever special instructions are given by the manufacturers, these should be followed while carrying out the dyeings of the dyestuffs. In order to compare the exhaust property of the dyestuff under test and the standard dyestuff, it is recommended to carry out the exhaust dyeings. Normally the yellow dyeings are difficult to compare visually, it is, therefore, advisable to add a constant amount of similar type of blue dyestuff and get the dyeings in green colour. The green dyeings would facilitate the visual comparison in determining the strength of the dyestuff.

This standard contains **3.2** and **4.1** which call for agreement between the buyer and the seller and which permit the buyer to use his option for selection to his requirements.

The composition of the Committee responsible for the formulation of this standard is given at Annex B.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

# Indian Standard

## TEXTILE DYESTUFFS — METHOD FOR DETERMINATION OF STRENGTH OF DIRECT DYESTUFFS BY DYEING TEST

( First Revision )

### 1 SCOPE

This standard prescribes a method for determination of strength of water-soluble direct dyes by normal dyeing test.

### 2 REFERENCES

The following standard contains provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

IS No.	Title
1070 : 1992	Reagent grade water

### 3 SAMPLING

#### 3.1 Lot

All the containers of the same dye and of the same concentration delivered to a buyer against a despatch note shall constitute a lot.

3.2 Unless otherwise agreed to between the buyer and the seller, the number of containers to be selected at random from a lot shall be as given in Table 1.

**Table 1 Sample Size**  
( Clause 3.2 )

Lot Size (1)	Sample Size (2)
Up to 100	3
101-300	4
301-500	5
501 and above	7

3.3 From each container draw small quantities of dye by a suitable sampling instrument from at least 3 different parts and mix them thoroughly to get a composite

sample weighing about 20 g. This shall constitute the test sample.

### 4 STANDARD DYESTUFF

The standard sample of dyestuff against which the strength of dyestuff under test is evaluated shall be as agreed to between the buyer and the seller.

### 5 QUALITY OF REAGENTS

Unless specified otherwise pure chemicals shall be employed in tests and distilled water shall be used where the use of water as reagent is intended.

NOTE — 'Pure chemicals' mean chemicals that do not contain impurities which affect the experimental results.

### 6 EVALUATION OF STRENGTH OF DYESTUFF

6.1 Before dyeing the hanks, carry out a preliminary test to determine the approximate strength of the dyestuff under test by the method given in 6.1.1.

6.1.1 Take separately 10 ml of 0.1 percent solution of the dyestuff under test and the standard dyestuff (see A-4.1). Put a spot each of the solutions of the dyestuff under test and the standard dyestuff on the filter paper. Visually examine the spots. If they are not equal, dilute the stronger solution with water to such an extent as to get approximately equal depth of spot on filter paper. Calculate the approximate strength of the dyestuff under test by the following formula:

Approximate strength of dyestuff under test, percent =

$$\frac{V_t \times 100}{V_s}$$

where,

$V_t$  = Final volume in millilitres, of solution of the dyestuff under test; and

$V_s$  = Final volume, in millilitres, of solution of the standard dyestuff.

**6.2** Prepare 100 percent and 95 percent of 1 percent depth of the dyestuff under test by following the procedure given in Annex A.

NOTE — Depending on the strength of dyestuff under test, the hanks may be dyed in other suitable depths. One of the two dyeings may be 0.5, 1.5 or 2 percent depth (instead of 1 percent) so as to give medium shade which is convenient for visual comparison. The other dyeing would be of 95 percent strength of the first dyeing.

**6.3** Similarly, prepare dyeings of different percentages (see Note 1 and 2) of standard dyestuff by following the procedure given in Annex A.

NOTES:

**1** The percentages of strength of dyeings of standard dyestuffs should be so arranged that the difference between the two consecutive dyeings is approximately 5 percent and the dyeings are well-distributed on either side of the approximate percentage strength determined by the spot, test.

Example: If the strength of the dyestuff as determined by the spot test is 60 percent, then the different dyeings of the standard dyestuff should be of 60 percent, 60 + 5 percent (57 and 63 percent) and 60 + 10 percent (54 and 66 percent).

**2** The dyeings obtained with the dyestuff under test should fall within the range of dyeings obtained with the standard dyestuff.

**6.4** Carry out the dyeings of the fresh hanks in the exhaust liquor of the above dyeings by following the procedure given in A-4.3.

**6.5** Compare the dyeings obtained as in 6.2 and the dyeings obtained as in 6.3 (see Note). Select a dyeing of the standard dyestuff which exactly matches with one of the dyeings of the dyestuff under test. Note the percentages of the dyeings which match exactly.

NOTE — Before comparing the dyeings, they should be spread out properly. The dried hanks should be laid side by side in the same plane and oriented in the same direction. They should be combed to a thickness to avoid the effect of other backing on the appearance. The hanks should be compared, if possible, under D 65 light. The consistency in strength variation of different dyeings of standard dyestuff and the dyestuff under test should be observed. If the strength variations between the two consecutive dyeings are not constant, the dyeings should be repeated.

**6.6** Calculate the strength of the dyestuff under test by the following :

$$S = \frac{A \times 100}{B}$$

Where,

$S$  = Strength of dyestuff, in percent;

$A$  = Percentage dyeing of the standard dyestuff; and

$B$  = Percentage dyeing of the dyestuff under test matching with  $A$ .

## 7 REPORT

**7.1** Report the value obtained as in 6.6 as the strength in percent of the dyestuff under test.

**7.1.1** Report the shade of the dyestuff under test in comparison with the shade of the standard dyestuff.

**7.2** Report also the shade of the exhaust dyeings of the sample in comparison with the shade of the exhaust dyeings of the standard dyestuff.

## ANNEX A

( *Clauses 6.2 and 6.3* )

## GENERAL METHOD FOR DYEING OF DIRECT COLOURS

## A-1 APPARATUS

**A-1.1 Dye Vessels**, porcelain or stainless steel beakers or dye-vessels provided for mechanically agitated dye-baths.

## A-1.2 Watch-glass

**A-1.3 Graduated Pipettes**, capable of measuring correct to 0.1 ml.

## A-2 DYEING ASSISTANTS

**A-2.1 Water, Distilled Water** (*see* IS 1070), shall be used in the preparation of the dye-bath.

NOTE — For rinsing water having hardness of not more than 50 ppm expressed as calcium carbonate may be used.

**A-2.2 Soda Ash Solution**, 10 percent (w/v).

**A-2.3 Sodium Chloride Solution**, 10 percent (w/v).

NOTE — 10 percent solution (w/v) of sodium sulphate may be used.

## A-3 PREPARATION OF HANKS FOR DYEING

**A-3.1** A sufficient number of hanks of scoured, bleached, unmercerized cotton yarn having no finishing chemical or blueing agent shall be used in this test. Each hank should weigh  $10 \pm 0.1$  g (*see* Note 2).

NOTES:

1 Any yarn normally used in the laboratories for carrying out trials or yarn of the following requirements, is suitable for this test:

- a) Count – 10 tex x 2 (or 60s/2),
- b) Twist per metre - 750, and
- c) Cuprammonium fluidity not more than 5 rhes.

2 If the weight of the hank is not  $10 \pm 0.1$  g, then it should be weighed accurately and the amount of dyestuff and the chemicals to be taken should be calculated accordingly.

## A-3.2 Preparation of Test Hanks

The hanks shall be treated in boiling water for 10 min, squeezed evenly to contain approximately its own weight of water, cooled and entered into the dye-bath.

## A-4 PROCEDURE

## A-4.1 Preparation of Dyestuff Solutions

**A-4.1.1** Weigh accurately 1.0 g of dyestuff under test. Paste it thoroughly with cold water. Add hot water and dissolve the dyestuff. If necessary, heat the solution till it becomes clear. Dilute the solution to 1 litre with cold water.

**A-4.1.2** Similarly, prepare solution of the standard dyestuff by following the procedure given in **A-4.1.1**, but taking the standard dyestuff instead of the dyestuff under test.

A-4.2 Dyeing (for  $10 \pm 0.1$  g Hank)

**A-4.2.1** Pipette out separately the required amount of solution of dyestuff under test (*see* Note 1) in the dye-vessels so as to give 100 percent and 95 percent dyeings of the 1 percent depth (*see* 6.2 and Note under it). Add requisite quantity of water to make the volume of dye liquor 300 ml (*see* Note 2). Add 5 to 10 ml of sodium chloride solution depending on the nature of the dyestuffs (*see* Note 3). Stir the dye liquors and enter the wetted hanks at 40°C. Turn the hanks frequently so as to obtain level dyeings. of water-bath to 80°C within 20 min. Slowly raise the temperature of water-bath to 80°C within 20 min. Remove the hanks from the dye-bath, add second lot of 5 to 10 ml of sodium chloride solution and stir. Enter the hanks into the dye-bath and raise the temperature of the water-bath to boil and continue to dye at boil (of water-bath) for 40 min (*see* Notes 4 and 5). At the end of the dyeing squeeze the dyed hanks returning the squeezed out solutions back to respective dyebaths and rinse them well in cold water. Dry the hanks in oven at temperature not exceeding 70°C.

NOTES:

1 The amount of dye solution to be taken for dyeing to give required percentage may be calculated as follows:

Volume, in ml, of 0.1 percent solution of dyestuff =  $p \times y$

Where,

$p$  = Percentage depth of dyeing (for example, 0.5, 1 or 2 percent); and

$y$  = Percentage dyeing (for example, 95 or 100 percent).

General formula for the calculation is as follows:

Volume, in ml, of stock solution of dyestuff required for

$$\text{dyeing} = \frac{w \times p}{v} \times \frac{v}{100}$$

Where,

$w$  = Weight in g, of the hank;

$p$  = Percentage depth (for example, 0.5 or 1 percent);

$v$  = Strength in percent, of the dyestuff solution (0.10 percent in this case); and

$y$  = Percentage dyeing (for example, 95, 100 or 105 percent).

2 The liquor to material ratio should be 30 : 1.

3 One percent soda ash on the weight of the hanks should also be added, if dyestuff is sensitive to acid.

4 During dyeing, water should be added to make-up the volume lost by evaporation.

5 The total time taken for dyeing should be 70 min and the temperature should be raised to boil during first 30 min.

6 The dyeing process including amount of salt/liquor to material ratio may vary depending on the specific dyestuff and dyestuff manufacturer's recommendations. So, recommendations of dyestuff manufacturer should be considered.

**A-4.2.2** Similarly, pipette out separately different amounts of solution of the standard dyestuff in different dye-vessels (*see* Note). Dye the hanks by following the method given in **A-4.2.1**.

NOTE — The dyeings with the solutions of the dyestuff under test and of the standard dyestuff should be done simultaneously in the same water-bath.

### **A-4.3 Exhaust Dyeing**

Make up the volumes of the exhaust liquors (*see* **A-4.2.1** and **A-4.2.2**) to the original volume (300 ml). Enter fresh wetted hanks in the exhausted dye-baths and continue dyeing for 30 min at boil. Squeeze the hank, rinse well in cold water and dry.

**ANNEX B***( Foreword )***COMMITTEE COMPOSITION**

Textile Speciality Chemicals and Dyestuffs Sectional Committee, TXD 07

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